Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.
A. Supporting Content Web Sites

WEB TITLE: MOLECULAR BIOLOGY NOTEBOOK

WEB ADDRESS: http://www.rothamsted.ac.uk/notebook/courses/guide/dnast.htm#What'

DESCRIPTION: This site includes a comprehensive package for the hands-on teaching of Molecular Biology - Selected by the SciLinks program from NSTA, Copyright 2001.

INDICATORS: B-4.1, B-4.5

WEB TITLE: TUTORIAL ON DNA STRUCTURE, REPLICATION, TRANSCRIPTION, AND PROTEIN SYNTHESIS

WEB ADDRESS: http://www.ncc.gmu.edu/dna/index.htm
Yvette Petty, George Mason University; Steve Roberson maintains animations.

DESCRIPTION: This is an excellent site that includes a comprehensive study of molecular genetics.

INDICATORS: B-4.1, B-4.2, B-4.3, B-4.4, B-4.5

WEB TITLE: BIOLOGY I ANIMATIONS, MOVIES, & INTERACTIVE TUTORIAL LINKS

WEB ADDRESS: http://science.nhmccd.edu/biol/bio1int.htm

DESCRIPTION: This site contains animations that depict genetic concepts.

INDICATORS: B-4.1, B-4.2, B-4.3, B-4.5, B-4.6, B-4.7, B-4.8, B-4.9

WEB TITLE: GENETIC ENGINEERING AT AIR ACADEMY HIGH SCHOOL

WEB ADDRESS: http://academy.d20.co.edu/kadets/lundberg/index.html

DESCRIPTION: This site answers many questions regarding genetic engineering and has numerous links to examples.

INDICATORS: B-4.9

WEB TITLE: MENDELIAN GENETICS

WEB ADDRESS: http://www.ndsu.nodak.edu/instruct/mcclean/plsc431/mendel/mendel1.htm

DESCRIPTION: This site provides and excellent introduction to Mendelian Genetics.

INDICATORS: B-4.6, B-4.7

WEB TITLE: LEW PORTS BIOLOGY PLACE

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.
WEB ADDRESS: **http://www.lewport.wnyric.org/jwanamaker/index.htm**

DESCRIPTION: This site contains excellent animations that teach very difficult concepts such as mitosis, meiosis, DNA replication, transcription, translation, protein synthesis, and much more. Moreover, this site has links to other excellent sites.

INDICATORS: B-4.3, B-4.4, B-4.5

WEB SITE: ACCESS EXCELLENCE-NATIONAL HEALTH MUSEUM RESOURCE CENTER

WEB ADDRESS: **http://www.accessexcellence.org/RC/VL/GG/#Anchor-From-14210**

DESCRIPTION; This site contains a graphics gallery, which includes diagrams depicting the cell cycle as well as numerous molecular genetics concepts.

INDICATORS: B-4.1, B-4.2, B-4.3, B-4.4, B-4.5, B-4.6, B-7, B-4-9

WEB TITLE: THE BIOLOGY PLACE – BioCOACH

WEB ADDRESS: **www.biology.com**

DESCRIPTION: Free excellent tutorials which include animations depicting DNA structure, protein synthesis, meiosis, and Mendelian genetics and more.. It also has an AP Labs component.

INDICATORS: B-4.4, B-4-5, B-4.6, B-4.7

WEB TITLE: GREENWOOD GENETICS CENTER (GGC)

WEB ADDRESS: **http://www.ggc.org/**

DESCRIPTION: This site includes the following components – diagnosing genetic aberrations, counseling individuals and families, researching the cause of genetic diseases, educating health care providers, teachers, and the public about genetics. One can actually interact via the "ASK A GENETICIST" component.

INDICATORS: B-4.3, B-4.6, B-4.8, B-4.9

WEB TTILE: GENETICS EDUCATION CENTER – UNIVERSITY OF KANSAS MEDICAL CENTER

WEB ADDRESS: **http://www.kumc.edu/gec/**

DESCRIPTION: You name it; this site has lesson plans, information about careers in genetics, activities, research, biotechnology, etc.

INDICATORS: B-4.1, B-4.2, B-4.3, B-4.5, B-4.6, B-4.7, B-4.8, B-4.9

WEB TITLE: CELL BIOLOGY ANNIMATION

WEB ADDRESS: **http://www.johnkyrk.com/index.html**

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.

DESCRIPTION: Excellent animations and explanations pertaining to the topics of chromosomes, meiosis, DNA structure, replication, transcription, and translation.

INDICATORS: B-4.3, B-4.4, B-4.5

WEB TITLE: CELLS ALIVE

WEB ADDRESS: **http://www.cellsalive.com/meiosis.htm**

DESCRIPTION: Interactive animations and explanations pertaining to the topics of Meiosis I and Meiosis II.

INDICATORS: B-4.5

B. Suggested Literature

APA CITATION:
Klare, Roger . (2001). *Gregor Mendel: Father of Genetics.* Enslow Publishers

ISBN: 0894907891

LEXILE LEVEL: 620L

DESCRIPTION: Biography of the scientist who fathered genetics. Includes simple activities and demonstrations.

INDICATORS: B-4.6, B-4.

APA CITATION:
Phelan, Glen. (2003). *Uncovering the Structure of DNA*. National Geographic Society Publisher.

ISBN: 0792288998

LEXILE LEVEL: 690L

DESCRIPTION: Details the history and work of the famous scientists involved in discovering DNA and its structure.

INDICATORS: B-4.2

APA CITATION:
Marshall, Elizabeth. (1996). *The Human Genome Project*. Impact Books Publisher.

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.

ISBN: 0531158330

LEXILE LEVEL: 1110L

DESCRIPTION: Describes the fifteen-year multimillion-dollar Human Genome Project and its process of gene mapping, includes concerns of critics of the project.

INDICATORS: B-4.2

APA CITATION:
Cefrey, Holly. (2002). *Cloning and Genetic Engineering*. Children's Press

ISBN: 0516239163

LEXILE LEVEL: 790L

DESCRIPTION: Introduces cloning and genetic engineering, exploring the technology and social issues involved and looking forward to what the future might bring as it becomes possible to duplicate even human DNA.

INDICATORS: B-4.9

APA CITATION:
Motulsky, Amo G. & Vogel, Fredrich. (1997). *Human Genetics: Problems and Approaches.* Springer Publisher'

ISBN: 3540602909

LEXILE LEVEL: Not available

DESCRIPTION: A comprehensive study of human genetics including information pertaining to somatic and germ cell mutations.

INDICATORS: B-4.8

APA CITATION:
McConkey, Edwin H. 92004). *How the Human Genome Works*. Jones and Bartlett Publishers

ISBN: 0763723843

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.

LEXILE LEVEL: NOT AVAILABLE

DESCRIPTION: This book covers the essential principles of genetics in a readable, accessible format using real-life examples of the way genes affect human behavior, health and illness, development and evolution.

INDICATORS: B-4.8; B-4-9

APA CITATION:
Reilly, Philip R. (2000). *Abraham Lincoln's DNA and other Adventures in Genetics.* CSHL Press
ISBN: 0879696494

LEXILE LEVEL: NOT AVAILABLE

DESCRIPTION: Twenty-four true, wide-ranging tales of crime, history, human behavior, illness, and ethics, told from the personal perspective of the author, an eminent physician-lawyer who uses the stories to illustrate the principles of human genetics and to discuss the broader issues

INDICATORS: B-4.2; B-4.8; B-4-9

APA CITATION:
Berg, P. and Singer, M. (1992). *DEALING WITH GENES - The Language of Heredity*. Mill Valley, California: University Science Books, Blackwell Scientific Publications.

ISBN: 0-935702-69-5
LEXILE LEVEL: NOT AVAILABLE

DESCRIPTION: Written by two world-renowned researchers in molecular biology and illustrated with clarity and precision, this beautifully produced book serves as a text for students taking non-major courses in biology, genetics, molecular biology, and biotechnology. It is also ideal as a primer for self-study by the interested lay person. Four color insert.

INDICATORS: B-4.2; B-4.3

APA CITATION
Marshall, Elizabeth L. (1999**).** *High-Tech Harvest: A Look at Genetically Engineered Foods.* Franklin Watts, Inc.

ISBN: 0531114341

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.

LEXILE LEVEL: 1200

DESCRIPTION: An overview of recombinant DNA technology, or genetic engineering, techniques used to create crop plants and farm animals with characteristics that are attractive to farmers, food processors, and consumers.

INDICATORS: B-4.9

APA CITATION
Lazer, David. (2004). *DNA and the Criminal Justice System: The Technology Of Justice.* MIT Press.

ISBN: 026262186X

LEXILE LEVEL: NOT AVAILABLE

DESCRIPTION: The use of DNA technology will involve tough trade-offs between individual and societal interests. This book, written by a distinguished group of authors including U.S. Supreme Court Justice Stephen Breyer, explores the ethical, procedural, and economic challenges posed by the use of DNA evidence as well as future directions for the technology

INDICATORS: B-4.2; B-4.3

C. Suggested ETV Streamline SC or ITV Video Resources:

VIDEO TITLE: *Greatest Discoveries with BILL Nye: Genetics*

ETV STREAMLINE SC

DESCRIPTION: The Basics of Genes — Explore how genes are transmitted, where they are located, and how
they work. Understanding DNA — Explore the structure and functions of DNA. RNA and DNA Manipulation - Learn how RNA works and explore some exciting discoveries that allow us to manipulate and examine DNA. The Future of Genetics — Take a closer look at RNA interference and investigate the future of genetics.

TIME: 00:00 – 44:59

INDICATORS: B-4.1; B-4.2; B-4.3; B-4.6; B-4:7; B-4.9

VIDEO TITLE: *Meiosis and Gamete Formation*

ETV STREAMLINE VIDEO SC

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.

DESCRIPTION: Illustrates the phases of meiosis and explores its importance in maintaining the proper number of chromosomes during gamete formation. Explains how crossing over and non-disjunction increase diversity in the species. Addresses some of the chromosomal alterations that can take place during meiosis.

TIME: (02:00 – 05:06); (05:25 – 16:39); (17:40 – 18:30)

INDICATORS: B-4.5

VIDEO TITLE: *Genes, Mutations, and Viruses*

ETV STREAMLINE VIDEO SC

DESCRIPTION: Describes some of the different types of mutations in genes and how they are inherited. Uses sickle cell anemia as an example of a mutation that occurs in certain human populations. Examines the effects of environmental mutagens of cells and the role of viruses in changing DNA.

TIME: (00:00 – 14:36); (15:45 – 16:22)

INDICATORS: B-4.2; B-4.3; B-4.4; B-4.8

VIDEO TITLE: *Introduction to Classical Genetics and Monohybrid Crosses*

STREAMLINE VIDEO SC

DESCRIPTION: Outlines the principles which form the basis of classical genetics. Demonstrates the experiments that Gregor Mendel conducted on pea plants and reveals the laws of inheritance. Uses probability and Punnett squares to predict the results of monohybrid crosses. Outlines the principles which form the basis of classical genetics. Demonstrates the experiments that Gregor Mendel conducted on pea plants and reveals the laws of inheritance. Uses probability and Punnett squares to predict the results of monohybrid crosses.

TIME: (00:00 – 29:06)

INDICATORS: B-4.6; B-4.

VIDEO TITLE: *Transcription of DNA to Messenger-RNA*

ETV STREAMLINE VIDEO SC

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.

DESCRIPTION: Uses animation and demonstrations to show how DNA is transcribed into messenger RNA. Reveals the structure of messenger RNA and its constituent codons. Acquaints viewers with the various roles of messenger RNA and its importance in embryonic development.

TIME: (1:41 - 20:00)

INDICATORS: B-4.1; B-4.2; B-4.3; B-4.8

VIDEO TITLE: *The Language of Life: Understanding the Genetic Code*

STREAMLINE VIDEO SC

DESCRIPTION: The language of life". In Part One, the familiar structures of the English language are compared to the molecular language used by cells. Part Two covers the flow if information from DNA to protein in living cells. The example of a simple DNA gene that stores information for a small protein is used to explain this process. The process of genetic mutation, and its consequences to life on earth, is also presented.

TIME: (00:00 – 23:00)

INDICATORS: B-4.1; B-4.2; B-4.4; B-4.5; B-4.8

VIDEO TITLE: *Genes, Mutations, and Viruses*

STREAMLINE VIDEO SC

DESCRIPTION: Describes some of the different types of mutations in genes and how they are inherited. Uses sickle cell anemia as an example of a mutation that occurs in certain human populations. Examines the effects of environmental mutagens of cells and the role of viruses in changing DNA

TIME: (O6:35 – 14:37)

INDICATORS: B-4.4; B-4.8

VIDEO TITLE: *Translation and Protein Synthesis*

STREAMLINE VIDEO SC

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.

DESCRIPTION: Illustrates how coded genetic information in the **DNA** is translated into proteins in the cytoplasm. Introduces the process of transcription and examines the specific function of proteins that are produced in the body. Explains which foods provide the essential amino acids.

TIME: (00.00 – 29:07)

INDICATORS: B-4.1; B-4.2; B-4.3; B-4.4

VIDEO TITLE: *Human Genome*

STREAMLINE VIDEO SC

DESCRIPTION: It's a project of enormous magnitude: mapping the human genome. Learn how what began with the discovery of DNA has led to the understanding of which human genes are responsible for specific human traits, including growth, development, health, and even personality. Produced by Discovery Channel School.

TIME: (00:00 – 50:00)

INDICATORS: B-4.1; B-4.2; B-4.3; B-4.4; B-4.8; B-4.9

VIDEO TITLE: *Elements of Biology*

SC ETV VIDEO

DESCRIPTION: This video explores genetics and molecular basis of inheritance.

TIME: (00:00 – 20:000

INDICATORS: B-4.1; B-4.2; B-4.3; B-4.4; B-4.6; B-4.7

D. Career Connections:

GENETICS COUNSELOR

Standard B-4: The student will demonstrate an understanding of the molecular basis of heredity.
A genetic counselor is a health professional academically and clinically prepared to provide genetic services to individuals and families seeking information about the occurrence, or risk of occurrence, of a genetic condition or birth defect. Practicing as part of a genetic services delivery team, the genetic counselor communicates genetic, medical, and technical information in a comprehensive, understandable, nondirective manner with knowledge of and insight into the psychosocial and ethnocultural experiences important to each client and family. The counselor provides client-centered, supportive counseling regarding the issues, concerns, and experiences meaningful to the client's circumstances. B.4.8; B.4.9

FORENSIC SEROLOGIST

Forensic serology is the study of blood groups, blood, and other bodily fluids for identification purposes following a crime. Forensic serologists are also on the forefront of the new techniques of DNA fingerprinting, which offer the possibility of positive identification of an individual by any available body cells. B-4.3

PLANT BREEDER/GENETICIST

Plant breeders/geneticists apply a range of techniques to produce new and improved varieties of plants for cultivation and use. Such improvements include yield, disease resistance, maturation time, nutritional value and various physical and physiological characteristics. The geneticist or biotechnologist would be more laboratory-based, using advanced and sophisticated molecular biology techniques to study and manipulate genes, including DNA transfer within or between species. B-4.9

MEDICAL GENETICIST

A medical geneticist is a physician trained in diagnostic and therapeutic procedures for patients with genetically-linked diseases. This specialist uses modern cytogenic, radiologic, and biochemical testing to assist in specialized genetic counseling, implements needed therapeutic interventions, and provides prevention through prenatal diagnosis. B-4.2; B-4.3; B-4.8; B-4.9

PHARMACOGENOMICIST

The science of understanding the correlation between an individual patient's genetic make-up (genotype) and their response to drug treatment. Some drugs work well in some patient populations and not as well in others. Studying the genetic basis of patient response to therapeutics allows drug developers to more effectively design therapeutic treatments. B-4.2; B-4.6; B-4.7